Suppliers of deinking s ems are working to meet the demand for high-quality paper made from low-quality waste. Amanda Marcus rounds up the latest developments and lists new orders worldwide.

EXHIBIT F

ATTACHMENT 1

Neutral deinking makes its debut

SOME RECENT AND PLANNED DEINKING INSTALLATIONS[1]

Country	Company	Mill location	Startup date	Capacity (1,000 tons/yr)	Wastepaper	Grade	End-use Supplier
Australia	Australian Newsprint Mills	Lavington, NSW	1993	122.5*	News/magazines	Newsprint	Voith
Austria	Leykam-Mürztaler	Gratkorn	1993	40*	News/magazines	Newsprint	Voith[2]
Argentina	Celulosa Campana	Zarate	1994	45.5	Mixed waste	Tissue	Sulzer Papertec
Argentina	Papel Prensa	Buenos Aires	1993	21	Waste	Newsprint	Lamort
Canada	Alberta Newsprint	Whitecourt	1993	21*	News/magazines	Newsprint	Voith[3]
Canada	QUNO (Quebec & Ontario Pap)	Thorold	1993	70*	News/magazines	Newsprint	Voith[3]
Canada	Spruce Falls Power & Paper	Kapuskasing	1993	87.5*	Old newspamphlets	Newsprint	Voith[3]
China	Guangzhou Paper	Guangzhou	1993	32	Ledgers	Fine paper	Black Clawson
China	Hanzhong Pulp & Paper	-	1994	9	Waste	Whiteboard base	Lamort/Aikawa
China	Xuecheng Huazhong Paper	-	1993	9	Waste	Whiteboard base	Lamort/Aikawa
China	Yanjin Paper	Nanping	1994	35*	News/magazines	Newsprint	Beloit
France	Chapelle Darblay	Pont Audemer	1993	6	Ledgers	Fine paper	Black Clawson
Germany	Dresden Papier	Freital	1994	42	News/magazines	Graphic papers	Sulzer Papertec
Germany	Palm	Eltmann	1994	168	News/magazines	Newsprint	Sulzer Papertec
Germany	Sachsen Papier	Ellenburg	1994	350	News/magazines	Newsprint	Sulzer Papertec
Germany	Schwedt Pap. und Karton	Schwedt	1994	143.5	News/magazines	Graphic papers	Sulzer Papertec

*1: This list is not intended to be comprehensive. Orders since the last PPI Deinking Survey in October 1992. 2: Built by Voith St. Pölten, Austria, a Voith licensee. 3: Built by Voith Appleton, USA, a Voith licensee. 4: Andritz was acting as a licensee of Sulzer Papertec, Germany. * = Calculated from daily capacity, on the basis of 350 production days/yr.*

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WASTE IS NO LONGER a dirty word. On the contrary, an increasing number of consumers, and hence papermakers, can't seem to get enough of it. According to PPI statistics (see table), the world recovered almost 92 million tons of wastepaper in 1992, up from 87 million tons in 1991, and consumed 95.5 million tons, four million tons more than the previous year. The world's average utilization rate has risen by two points to 39%.

From Argentina to Austria, and Mexico to Morocco, the latest reference lists from suppliers *(see above)* show that mills are still spending money on waste treatment systems, even during a time of severe cutbacks in capital investment in the industry. Increasing environmental legislation and stringent quality requirements are demanding rapid developments from manufacturers of deinking equipment. This article rounds up the latest news from some of the sector's major suppliers.

All agree that differences in customer demands in Europe and North America are narrowing. Black Clawson, USA, reports that US customers are beginning to look at the European approach to projects, looking for more liability from the supplier to make the system perform. "As more of these projects come under study, it is becoming apparent that the vendor's ability to provide special financing or equity participation is becoming as important as the technological issues that have always faced us," comments Black Clawson.

The parameters of evaluation from the customers' viewpoint are basically the same: All mills are seeking price performance, higher brightness, dirt reduction, ash control and higher yields from their systems: no mean task for suppliers.

Customers want more for less

One of the major challenges facing suppliers of wastepaper treatment systems is that mills are using lower-quality and hard-to-deink waste while requiring ever-higher quality. As a result, according to Black Clawson, research in the USA is focusing largely on the removal of difficult handle debris that is typically

grade office papers: unbleached fibers, laser-printing inks, UV coatings and some dyed papers. The supplier adds that it is only a matter of time before the same concerns are transferred to system designers in the European and Asian markets.

Mills get into neutral gear

Neutral deinking is being hailed as the latest breakthrough in waste treatment technology by Lamort of France. It says that the benefits of deinking in neutral media are proving to be far beyond initial expectations. Such a solution is attractive because it requires less chemicals, so chemical oxygen demand is reduced and companies save on chemical costs. Suppliers to the industry say that controllability, drainage, pulp strength, bleachability and screening efficiency are all better than with conventional deinking techniques.

The Stephenson Group, UK, which supplies deinking chemicals, agrees that demand for neutral deinking solutions and closed-water circuits is growing. Customers want to use lower and lower grades of

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wastepaper for deinking, comments the company, and this is leading to problems with product quality (both brightness and stickies), which the customer expects the supplier to solve.

In response, a considerable amount of resources is being invested in upgrading washing systems as part of a "complete ink removal" solution provided by a combined wash/flotation system. Cost is the limiting factor, explains Stephenson, but work on the concept is continuing.

The first neutral deinking system using household waste to make graphic papers is already in operation at Zwingen in Switzerland. The line started up last July and is the result of a joint project between the mill, French supplier Lamort, and Dr. W. Kolb. Lamort explains that since the process does not use sodium hydroxide, an efficient fiber-to-fiber friction is imperative if good ink removal is to be achieved at the pulping stage, although post-flotation is still available. Lamort recommends its Helico pulper for such applications.

Waste is floating on air

Neutral flotation is quite different to conventional deinking in that the ink particles adhere directly to the air bubbles, Lamort explains. The foam structure of the cell is also completely different. Consequently, demand is growing for a flotation cell which can handle an increased number of smaller bubbles and separate foam from fiber. Lamort's response is the Verticel which works on the concept of injection and has a controlled flow pattern.

Lamort says that Verticel has a foam-removal system which is particularly suited to neutral deinking.

Voith, Germany, is also continuing work on flotation and has recently launched its new laboratory flotation cell type E, a reduced version of the industrial unit. Five have already been sold.

Voith's flotation machine consists of a mixing tank followed by primary and secondary stages with the secondary stage being used to recover useful fibers from the overflow of the primary stage. Each stage is composed of tubular cells arranged in series, the number and size of which depend on the flotation behavior of the printing inks and on the throughput.

According to the supplier, the unit's main advantages lie in maximum brightness with low energy consumption and an above-average purity of deinked stock, due to multiple, consistent, forced ventilation of each cell. Flotation is accelerated because air supply is increased, requiring fewer cells, explains the supplier.

Black Clawson is working with its licensee in Japan, IIM, on the new IIM-BC Flotator flotation cell. According to the supplier, the key to the unit's performance is its ability to mix uniformly high volumes of air into the stock slurry so that maximum brightness and dirt speck removal can be achieved. The air bubbles that are generated by the twin turbines in each cell are evenly distributed across the spectrum of sizes needed to optimize particle-removal efficiency, from 5-500 microns.

Black Clawson claims that the Flotator can improve brightness by 14 points in a single pass, and that it has shown improved speck removal efficiency, even with hard-to-deink grades such as laser-printed office papers or UV-coated grades. The supplier intends to market the Flotator unit on both sides of the Atlantic.